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Influence of Technology on the Workplace and Worker-Management Relations

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Technology Influences

- Technology can be both beneficial and destructive
- Has generated controversy since at least the beginning of the Industrial Revolution (Luddites)
- Over the long run, the benefits have been long term, and the disruptions, though frequently painful, have been short term
- Has been a recurrent topic of public policy debate
  - National Commission on Technology, Automation, and Economic Progress, 1966
- Technology means change: how resources (people and financial) are invested/directed

Benefits and Problems

- Electronics Industry Example
  - In the 1950's, electronic devices were based on vacuum tube technology. With the invention of the transistor (1948), vacuum tube technology started to become obsolete.
  - In the short run, workers making vacuum tubes were displaced, as new semiconductor devices penetrated the market.
  - In the long run, semiconductor companies, as a group have become one of the largest employers (170,000 employees U.S., 1993) and have a manufactured market value of $39 billion (North American-based companies). These companies utilize sophisticated manufacturing processes and require a very skilled workforce.

Technology Changes

- Response to marketplace demands
- Increases productivity, if properly applied
- Creates and destroys jobs
- Creates new fields of endeavor

- Affects both manufacturing and service industries
- Leads to changes in the workplace

Emerging Technologies

- Critical and Emerging Technologies Lists
  - National Critical Technologies Panel
  - DOD Critical Technologies
  - DOC Emerging Technologies
  - Council on Competiveness
  - Japanese List
  - European Community List
- Technology Categories
  - Materials
  - Manufacturing
  - Information and Communications
  - Biotechnology and Life Sciences
  - Aeronautics and Surface Transportation
  - Energy and Environment

U.S. REPORT CARD: STATUS 1989

	Versus Japan	Versus Europe
Behind	Advanced Materials Advanced Semiconductor Devices Digital Imaging Technology High-Density Data Storage Optoelectronics	Digital Imaging Technology
Even	Superconductors	Flexible Computer-Integrated Manufacturing Superconductors
Ahead	Artificial Intelligence Biotechnology Flexible Computer-Integrated Manufacturing High-Performance Computing Medical Devices and Diagnostics Sensor Technology	Advanced Materials Advanced Semiconductor Devices Artificial Intelligence Biotechnology High-Density Data Storage High-Performance Computing Medical Devices and Diagnostics Optoelectronics Sensor Technology

From: Emerging Technologies, A Survey of Technical and Economic Opportunities
U.S. Department of Commerce, Spring 1990

U.S. REPORT CARD: TRENDS

	Versus Japan	Versus Europe
Losing Badly	Advanced Materials Biotechnology Digital Imaging Technology Superconductors	Digital Imaging Technology Flexible Computer-Integrated Manufacturing
Losing	Advanced Semiconductor Devices High-Density Data Storage High-Performance Computing Medical Devices and Diagnostics Optoelectronics Sensor Technology	Medical Devices and Diagnostics
Holding	Artificial Intelligence Flexible Computer-Integrated Manufacturing	Advanced Materials Advanced Semiconductor Devices High-Density Data Storage Optoelectronics Sensor Technology Superconductors
Gaining		Artificial Intelligence Biotechnology High-Performance Computing

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Jobs Created/Destroyed

- Grocery Industry Example
  - Computerized inventory and ordering system coupled with optical scanner and bar code technology replaces stock clerks' inventory function, and replaces other clerical workers
  - Creates manufacturing jobs in optical scanning industry as well as in their suppliers, such as for optical scanner window materials
  - More jobs are lost than created, but those created are generally higher paying based on their being more knowledge-intensive
  - Jobs created are not necessarily located in the same geographic region
  - What happens to those workers who are displaced?

Technology Examples

- Information and Communication
  - National Information Infrastructure
  - Government-industry partnership to develop and implement computing and networking technology essential for total electronic commerce
  - Relies on advances in many emerging technologies
- Products
  - Personal computer, did not exist 20 years ago
  - Now ubiquitous with vast variety of applications
  - Increases ability to create, store, analyze, and access information
- Processes
  - Circuit creation for PC and other applications
  - Sophisticated process requiring clean manufacturing facilities, standards, and skilled workforce

Manufacturing Technology

- Flexible Manufacturing
  - Allows creation of two or more products on the same manufacturing line
  - Relies on adaptability of manufacturing hardware and people running it
  - More sophisticated systems use extensive on-line sensing and control systems to replace workers

Manufacturing Technology

- Computer Aided Design/Computer Aided Manufacturing
  - CAD/CAM
  - Allows simulated creation and fabrication of products using computers and networks
  - In principle, and in limited practice, electronic designs can be translated into code required for making components via computer numerically controlled (CNC) machine tool
  - Extensive work required to establish interchange standards and protocols
  - CAM portion requires extensive use of computers and sensors at all stages of the process

Manufacturing Technology

- Electronic Commerce
  - Exchange of product and business information about manufacturing needs/opportunities
  - Allows creation of "virtual" corporation or joint venture to manufacture specific product; all partners do what they do best, wherever they are located
  - Allows creation of "virtual" office (laptop computer, cellular telephone, portable fax) for on-the-road staff (e.g., sales force)
  - Requires extensive interactions between all levels of all the partners and ability to exchange information rapidly, correctly, and securely

Economic and Competitiveness Strategies

- Quality
- Speed to market
- Sales/marketing
- After-sale service

Decision Making

- Quality strategy pushes to lowest level possible
- Requires practice and willingness to take responsibility for action
- Ability to make judgements limited or enhanced by experience and education

Training Needs

- More sophisticated flexible manufacturing environment requires well educated and trained workforce that can be continually upgraded
- Apprentice programs where appropriate
- Exposure to variety of opportunities and experiences enhances judgement
- Requires interested and committed individuals and companies
- Enhancement of skills available to all employees for all jobs within the company?

Summary

- Advances in technology are forcing changes in the workplace and will require changes in the workforce
- A variety of technologies will be important
- Worker-management relations need to change to adapt to the changes in technology